Inertial Measurement Unit Test System (IMUTS) Relay Replacement

Status: Technical Success

PROBLEM / OBJECTIVE

The Inertial Measurement Unit Test System (IMUTS) is used to test the navigational guidance units (gyros) of Navy aircraft such as the A-6E, AV-8B, E-2C, EA-6B ES-3A, F-14A/B/D and the F/A-18A/B/C/D/E/F. The original IMUTS design dates back to 1977, while the latest version (IMUTS III) was released in 1993. A total of 96 IMUTS systems are currently in use. Each IMUTS electronics section contains 10 relay boards containing 68 mercury relays on each board. The original replacement relays have become obsolete and are no longer available. Concern over the environmental impact of mercury is a major factor in looking for a replacement that does not involve hazardous material.

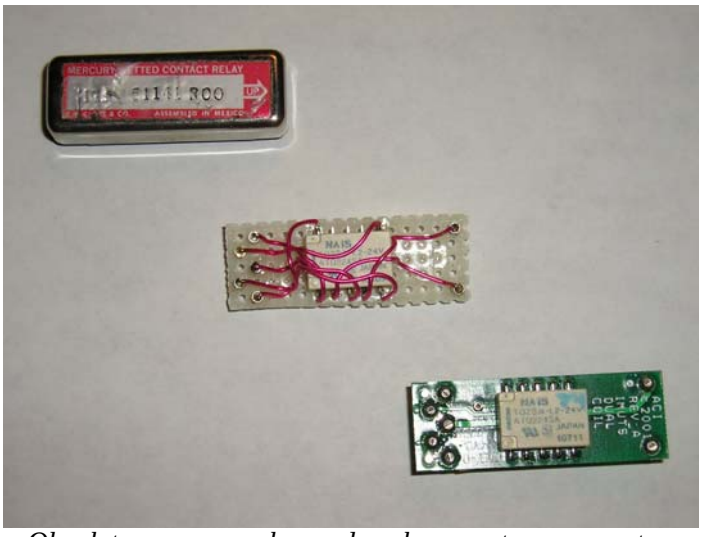
ACCOMPLISHMENTS / PAYOFF

Process Improvement:

Redesign of the system, or a large part of it, would require a multi-year, multi-million-dollar effort. Additionally, the lack of available parts was starting to impact the ability to keep the systems available. NAVICP and the Depot at North Island, CA, working with EMPF, looked for a solution that did not have a system level impact. Using a Rapid Response authorization from the Office of Naval Research (ONR), the EMPF investigated alternative solutions to the relay problem. The relay boards are separated in the assembly by only 0.60" so a number of candidate relays were eliminated due to height. Modern surface mount relays were identified that were mechanically and electrically acceptable. A "daughter board" was designed that had the pinouts of the original relays with connections to match the footprints of the new relays. Breadboards were assembled and tested and a manufacturable board was designed. The initial group of the new replacement relay, which contains no mercury, underwent successful qualification testing at North Island.

Implementation and Technology Transfer:

Cost Savings: This solution represents approximately 50 percent cost savings at the component level. The assembled relay "daughter board" costs $12.00 compared to $30.00 for the mercury relay. Direct cost comparison is difficult because the direct replacement relay is no longer available.



Obsolete mercury relay and replacement component.

If all relays in the fleet are replaced, the savings will be $1,175,040 (68 relays/board x 10 boards/system x 96 systems x $18.00 savings /relay). Relay went through sea trials at North Island Depot and available for integration.

Expected Benefits:

Cost Avoidance: This solution avoids a redesign of the system or the electronics part of the system. The redesign cost plus production would be many millions.

Environmental Compliance: The replacement of the old relays with the "daughter board" alternative removes 52.7 pounds of mercury from the environment.

TIME LINE / MILESTONE

Start Date: Feb 2001
Complete Development Date: Aug 2001
Complete Qualification Testing Date: May 2002

FUNDING

Total ManTech Investment: $46K

PARTICIPANTS

COE EMPF
NAVICP, Philadelphia, PA
North Island Depot, CA